

Three new species of the genus *Trilacuna* Tong & Li, 2007 (Araneae, Oonopidae) from Yunnan Province, China

Jimeng Ma^{1*}, Dongju Bian^{2*}, Yanfeng Tong¹, Zizhong Yang³, Zhisheng Zhang⁴

¹ Life Science College, Shenyang Normal University, Shenyang 110034, Liaoning, China

² Key Laboratory of Forest Ecology and Management, Institute of Applied Ecology, Chinese Academy of Sciences, Shenyang 110016, China

³ National-Local Joint Engineering Research Center of Entomocutics, Dali University, Yunnan Dali, 671000, China

⁴ Key Laboratory of Eco-environments in Three Gorges Reservoir Region (Ministry of Education), School of Life Sciences, Southwest University, Chongqing 400715, China

Corresponding authors: Yanfeng Tong (tyf68@hotmail.com); Zizhong Yang (yangzzh69@163.com); Zhisheng Zhang (zhangzs327@qq.com)

Abstract

Three new species of the genus *Trilacuna* Tong & Li, 2007, *T. cangshan* Tong, Yang & Zhang, **sp. nov.** (♂), *T. wumanshan* Tong, Yang & Zhang, **sp. nov.** (♂), and *T. xiaoheishan* Tong, Yang & Zhang, **sp. nov.** (♂♀) are described from Yunnan, China. Descriptions, diagnoses, and photographs are provided.

Key words: Asia, distribution, goblin spiders, morphology, taxonomy



Academic editor: Yuri Marusik

Received: 9 May 2023

Accepted: 26 July 2023

Published: 14 August 2023

ZooBank: <https://zoobank.org/FC99CBBB-5353-4F81-B6F8-07A6E8ACCBF3>

Citation: Ma J, Bian D, Tong Y, Yang Z, Zhang Z (2023) Three new species of the genus *Trilacuna* Tong & Li, 2007 (Araneae, Oonopidae) from Yunnan Province, China. ZooKeys 1174: 289–300. <https://doi.org/10.3897/zookeys.1174.106130>

Copyright: © Jimeng Ma et al.

This is an open access article distributed under terms of the Creative Commons Attribution License (Attribution 4.0 International – CC BY 4.0).

Introduction

The family Oonopidae Simon, 1890 is composed of tiny spiders between 1.0 and 3.0 mm. They have a nearly worldwide distribution, occurring mainly in leaf litter, under bark, and in the tree canopy (Jocqué and Dippenaar-Schoeman 2006; Ubick and Dupérré 2017). Oonopidae is among the nine most diverse spider families with 1891 extant described species in 115 genera (WSC 2023).

The genus *Trilacuna* Tong & Li, 2007 currently comprises 39 species. All species are known from Bhutan, China, India, Indonesia (Sumatra), Iran, Korea, Malaysia, Myanmar, Nepal, Pakistan, Thailand, and Vietnam (Tong and Li 2007; Eichenberger and Kranz-Baltensperger 2011; Grismado et al. 2014; Malek-Hosseini et al. 2015). In China, the genus is represented by 17 species, of which seven species are from Chongqing, one species from Guizhou, and nine species from Yunnan Province (Tong et al. 2019; Huang et al. 2020, 2021; Wang et al. 2021). In this paper, three new *Trilacuna* species collected from Yunnan Province are described and illustrated.

Materials and methods

The specimens were examined using a Leica M205C stereomicroscope. Details were studied under an Olympus BX51 compound microscope. Photos were taken with a Canon EOS 550D zoom digital camera (18 megapixels) mounted on

* These authors contributed equally to this work.

an Olympus BX51 compound microscope. Vulvae were cleared in lactic acid. Scanning electron microscope images (SEM) were taken under high vacuum with a Hitachi S-4800 after critical point drying and gold-palladium coating. All measurements were taken using an Olympus BX51 compound microscope and are in millimeters. Taxonomic descriptions follow Tong et al. (2020). Type materials are deposited in Shenyang Normal University (SYNU) in Shenyang, China.

The following abbreviations are used in the text and figures: **ALE** = anterior lateral eyes; **ap** = apodemes; **as** = anterior sclerite; **blp** = basal leaf-shaped projection; **brc** = branch with row of combs; **bsh** = basal short “hairs”; **bth** = basal thin “hairs”; **cdb** = slightly curved distal branch; **db** = dorsal branch; **dth** = distal thick “hairs”; **ehb** = elevated hair base; **glo** = globular structure; **lb** = lateral branch; **lcb** = lateral curved branch; **ldi** = labium deep incision; **ldp** = large dorsal prong; **lh** = lateral “hairs”; **lmb** = long median branch; **mb** = median branch; **PME** = posterior median eye; **psp** = posterior spiracle; **sar** = sclerotized, recurved arches; **sdb** = short dorsal branch; **tmb** = thin median branch; **tsc** = transverse sclerite; **vbl** = ventral broad lobes; **vp** = ventral projection; **wfb** = distally widened flat branch.

Taxonomy

Family Oonopidae Simon, 1890

Genus *Trilacuna* Tong & Li, 2007

Type species. *Trilacuna rastrum* Tong & Li, 2007 from Yunnan, China.

Diagnosis. See Tong et al. (2020).

Composition. 42 species, including three described here.

Distribution. Iran to the Korean Peninsula and south to Sumatra.

Trilacuna cangshan Tong, Yang & Zhang, sp. nov.

<https://zoobank.org/D00C8223-91F4-4A42-8F73-AAAE7412F090>

Figs 1, 2, 8

Type material. **Holotype** ♂ (SYNU-660): CHINA, Yunnan Province, Dali Bai Autonomous Prefecture, Dali City, Cangshan Mountain, post-fire forest in 1999, 25°38'30"N, 100°08'04"E, Z. Yang leg., 2/11/2009.

Diagnosis. Males of the new species are similar to those of *T. bawan* Tong, Zhang & Li, 2019 in the shape of palp, but they can be distinguished by the reduced eyes (Fig. 1D, F) vs normal, the smooth sternum (Fig. 1E) vs with grooves at posterior part, and the slightly elevated epigastric region (Fig. 1B, C) vs epigastric region strongly elevated (Tong et al. 2019: fig. 1A, E, G–I).

Description. Male (holotype). **Body:** yellow, legs lighter; habitus as in Fig. 1A–C; body length 1.76. **Carapace:** 0.78 long, 0.67 wide; sides granulate, lateral margin rebordered (Fig. 1D, F). **Eyes:** vestigial, only visible in frontal view (Fig. 1D, F). **Mouthparts:** chelicerae straight, proximal region with one seta with elevated base; labium rectangular, anterior margin deeply incised; endites slender, distally branched (Fig. 1E, G, H). **Sternum:** surface finely reticulated (Fig. 1E). **Abdomen:** 1.01 long, 0.60 wide; booklung covers ovoid, surface smooth; dorsal scutum not fused to epigastric scutum; sperm pore situated

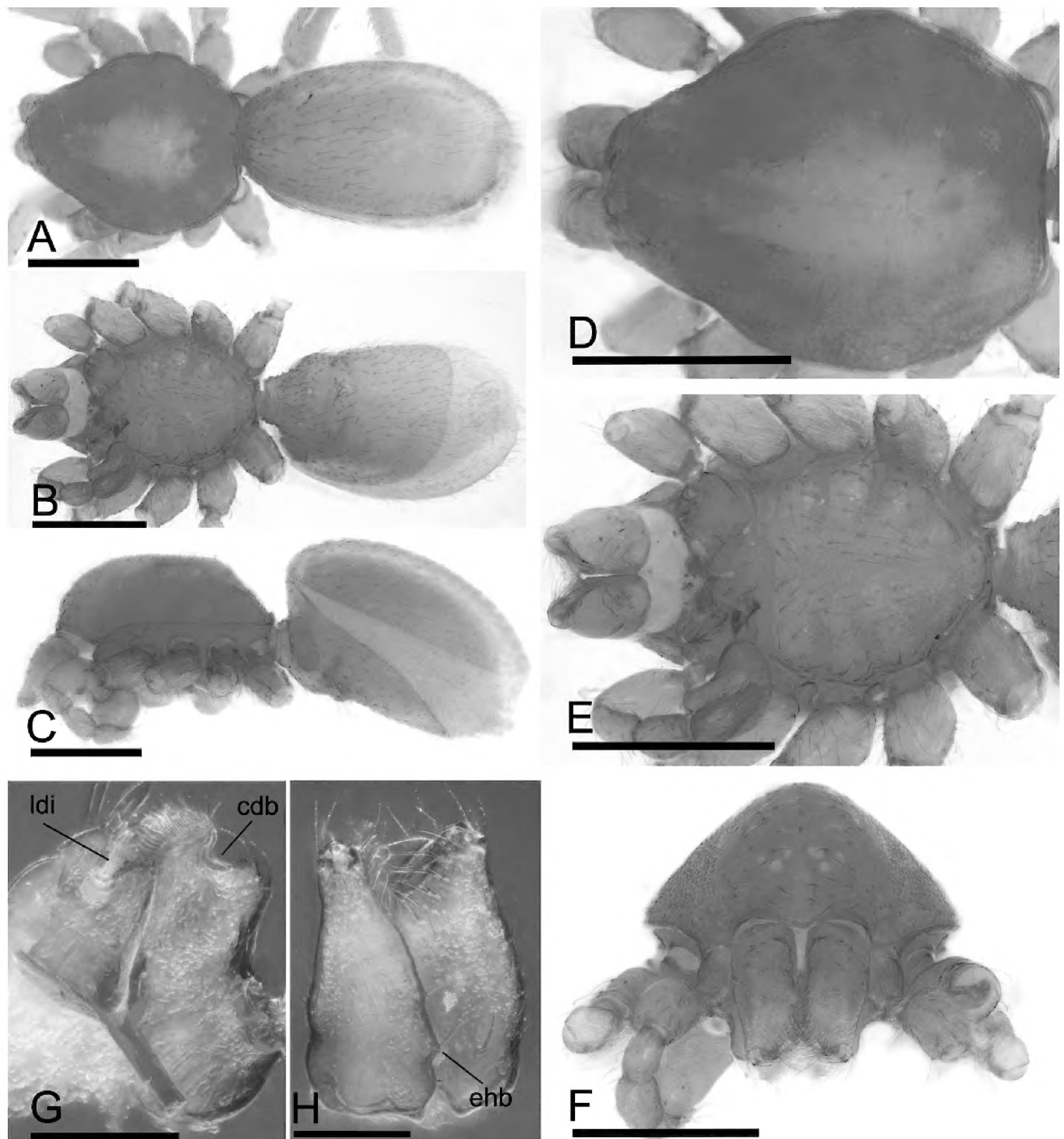


Figure 1. *Trilacuna cangshan* sp. nov., male holotype **A–C** habitus in dorsal, ventral, and lateral views **D–F** prosoma in dorsal, ventral, and anterior views **G** labium and endites in ventral view **H** chelicerae, slightly oblique lateral view. Abbreviations: cdb = slightly curved distal branch; ehb = elevated hair base; ldi = labium deep incision. Scale bars: 0.4 mm (**A–F**); 0.2 mm (**G, H**).

at level of anterior spiracles; apodemes present, posterior spiracles connected by groove; epigastric region slightly elevated, with a cluster of densely short setae (Fig. 1A–C). **Palp:** orange; 0.64 long (0.20, 0.13, 0.13, 0.18); femur greatly elongated (width/length = 0.64); bulb kidney-shaped, tapering apically; psempobolus with basal leaf-shaped projection (blp) and ventral broad lobes (vbl); with dorsal median branch (lmb) and retrolateral, long curved branch (lcb) (Fig. 2).

Female. Unknown.

Etymology. The specific name is a noun in apposition taken from the type locality.

Distribution. Known only from the type locality, Yunnan Province, China (Fig. 8).

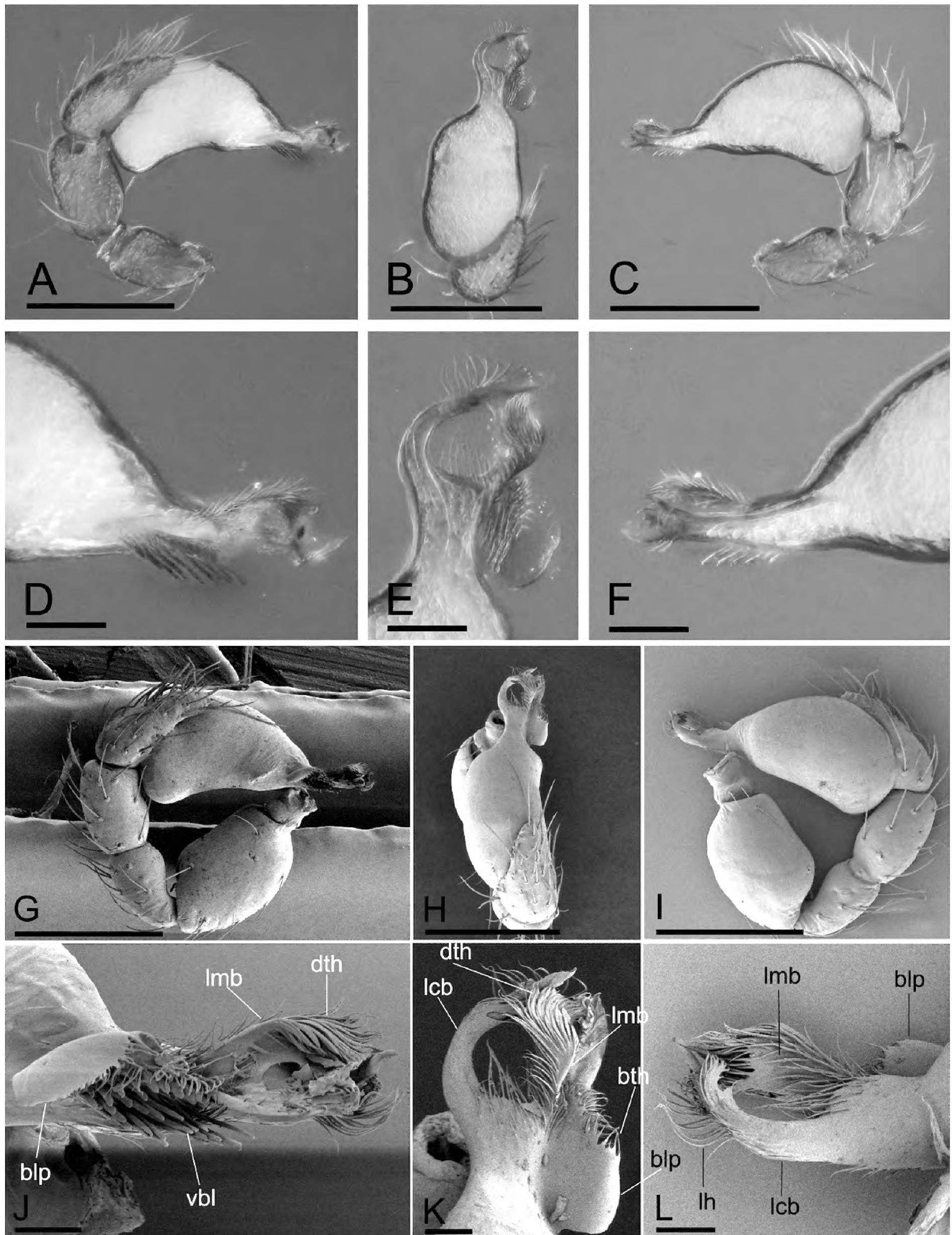


Figure 2. *Trilacuna cangshan* sp. nov., left male palp **A–F** (light) and right male palp **G–L** (SEM, images flipped horizontally) **A, G** prolateral view **B, H** dorsal view **C, I** retrolateral view **D, J** distal part of bulb, prolateral view **E, K** distal part of bulb, dorsal view **F, L** distal part of bulb, retrolateral view. Abbreviations: blp = basal leaf-shaped projection; bth = basal thin “hairs”; dth = distal thick “hairs”; lcb = lateral curved branch; lh = lateral “hairs”; lmb = long median branch; vbl = ventral broad lobes. Scale bars: 0.2 mm (**A–C, G–I**); 0.02 mm (**D–F, J–L**).

***Trilacuna wumanshan* Tong, Yang & Zhang, sp. nov.**

<https://zoobank.org/05309BE8-2203-4DD0-86B3-88B00D9CFC05>

Figs 3, 4, 8

Type material. Holotype ♂ (SYNU-661): CHINA, Yunnan Province, Lincang City, Cangyuan Wa Autonomous County, Banhong township, Wuman Hill, 23°15'15"N, 99°05'52"E, Z. Yang leg., 13/5/2021.

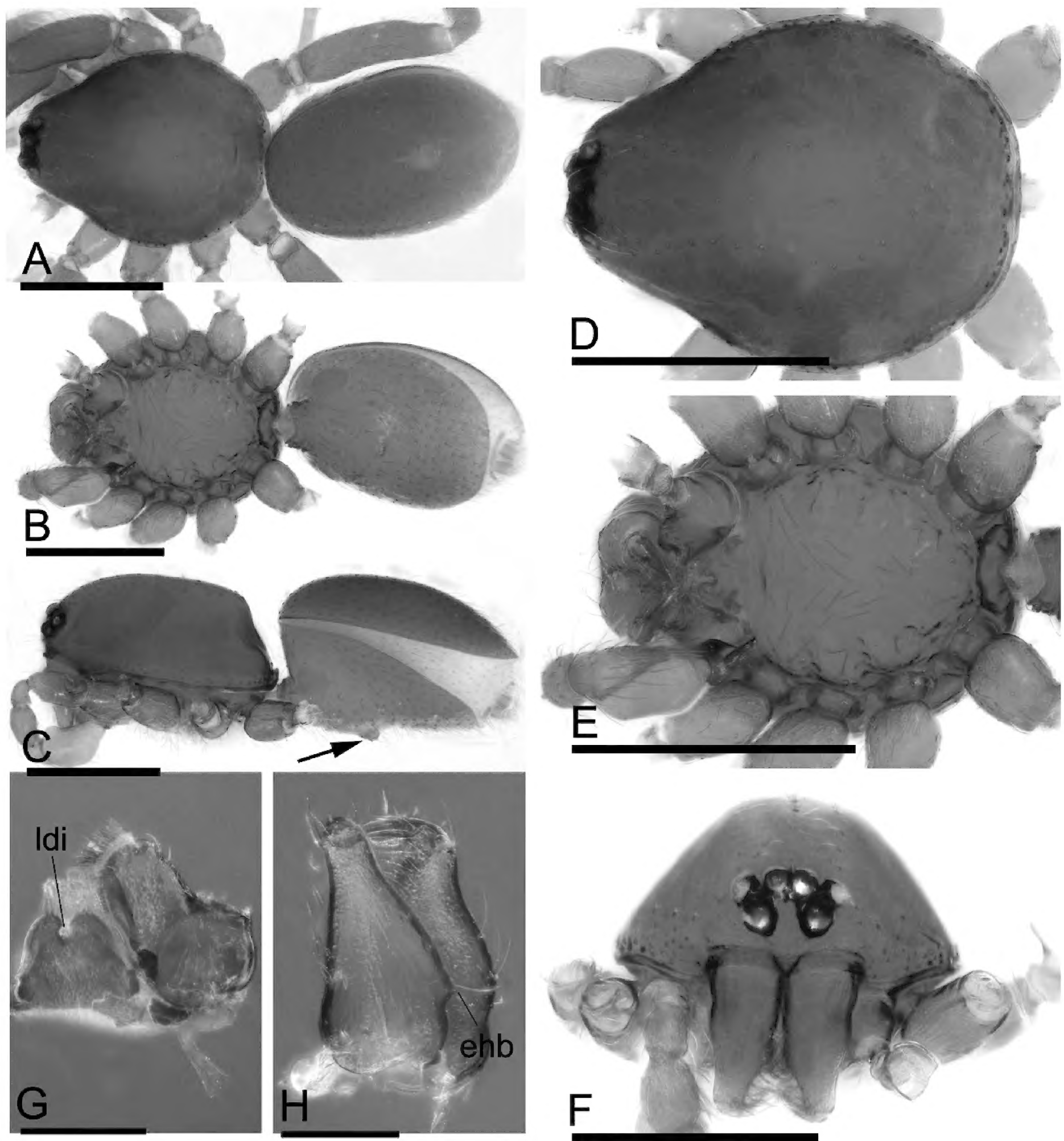


Figure 3. *Trilacuna wumanshan* sp. nov., male holotype **A–C** habitus in dorsal, ventral, and lateral views, arrow shows the elevated epigastric region **D–F** prosoma in dorsal, ventral, and anterior views **G** labium and endites in ventral view **H** chelicerae in slightly oblique lateral view. Abbreviations: ehb = elevated hair base; Idi = labium deep incision. Scale bars: 0.4 mm (**A–F**); 0.2 mm (**G, H**).

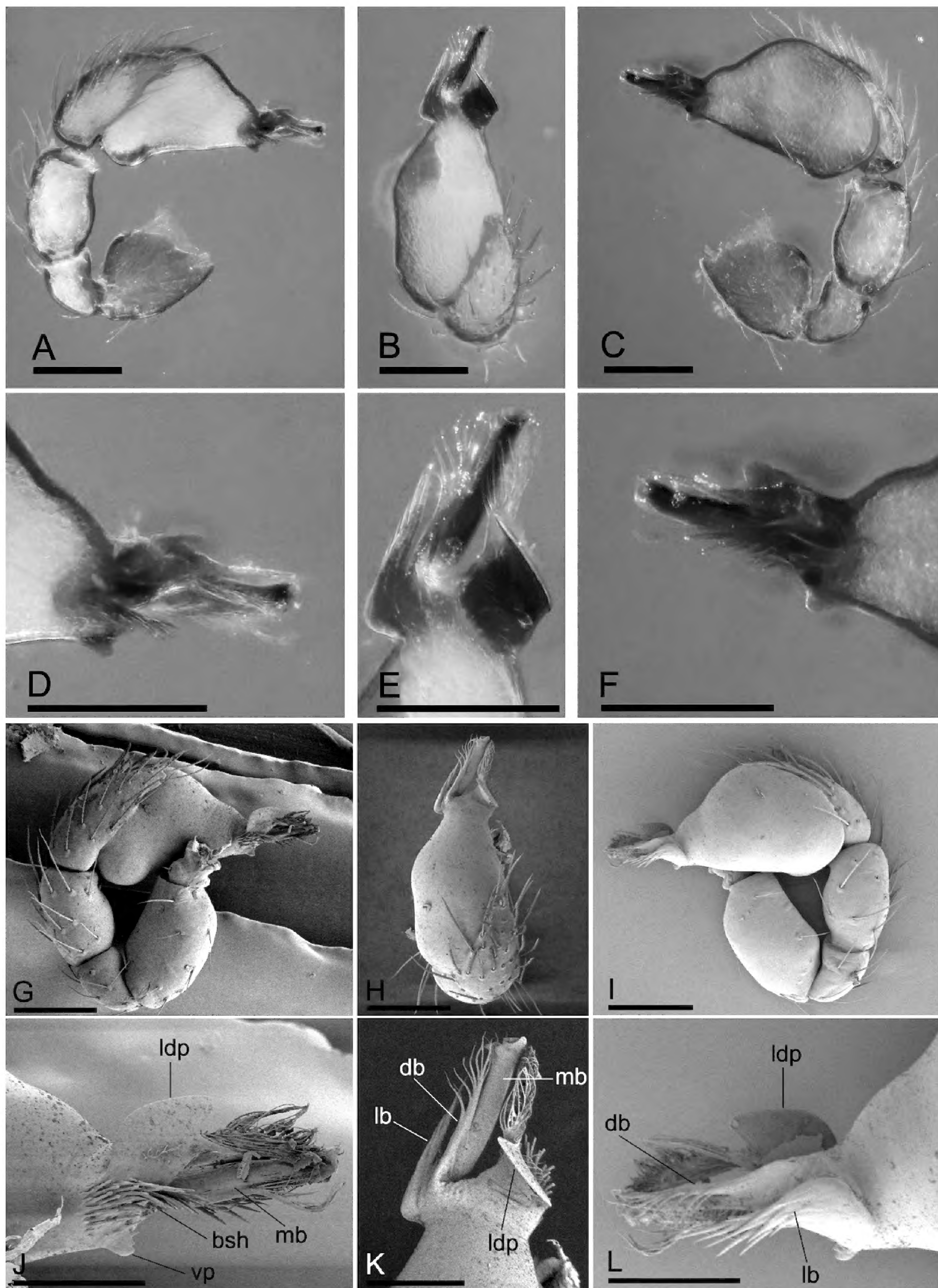


Figure 4. *Trilacuna wumanshan* sp. nov., left male palp, **A–F** (light) and **G–L** (SEM) **A, G** prolateral view **B, H** dorsal view **C, I** retrolateral view **D, J** distal part of bulb, prolateral view **E, K** distal part of bulb, dorsal view **F, L** distal part of bulb, retrolateral view. Abbreviations: bsh = basal short “hairs”; db = dorsal branch; lb = lateral branch; ldp = large dorsal prong; mb = median branch; vp = ventral projection. Scale bars: 0.1 mm (**A–C, G–I**); 0.05 mm (**D–F, J–L**).

Diagnosis. The new species is similar to *T. longtankou* Tong & Li, 2020 in the shape of the male palp, but it can be distinguished by the smooth sternum (Fig. 3B) vs sternum with two rows of paddle-shaped setae, and the large dorsal prong and the narrow lateral and dorsal branches of psembolus (Fig. 4J, K) vs a basal branch and several broad branches of psembolus (Huang et al. 2020: fig. 3E, F, H).

Description. Male (holotype). **Body:** yellow-brown, chelicerae and sternum lighter, legs yellow; habitus as in Fig. 3A–C; body length 1.44. **Carapace:** 0.70 long, 0.56 wide; sides smooth, lateral margin rebordered (Fig. 3D). **Eyes:** ALE largest, PME smallest; ALE separated from edge of carapace by 1.0 diameters (Fig. 3D, F). **Mouthparts:** chelicerae straight, proximal region with one hair with elevated hair base; labium rectangular, anterior margin deeply incised; endites slender, distally not branched (Fig. 3E, G, H). **Sternum:** surface finely smooth (Fig. 3E). **Abdomen:** 0.72 long, 0.47 wide; booklung covers ovoid, surface smooth; dorsal scutum not fused to epigastric scutum; sperm pore situated at level of posterior spiracles; apodemes present, posterior spiracles not connected by groove; epigastric region slightly elevated (Fig. 3A–C). **Palp:** orange; 0.54 long (0.16, 0.09, 0.12, 0.17); femur greatly elongated (width/length = 0.60); bulb triangle, tapering anteriorly; psembolus with large dorsal prong (ldp), a cluster of basal short “hairs” (bsh), and a small ventral projection (vp); with a broad median branch (mb), a narrow lateral branch (lb) and a dorsal branch (db) (Fig. 4).

Female. Unknown.

Etymology. The specific name is a noun in apposition taken from the type locality.

Distribution. Known only from the type locality, Yunnan Province, China (Fig. 8).

***Trilacuna xiaoheishan* Tong, Yang & Zhang, sp. nov.**

<https://zoobank.org/F599EE3B-6643-418A-8967-132D41CD1D3B>

Figs 5–8

Type material. **Holotype** ♂ (SYNU-653): CHINA, Yunnan Province, Baoshan City, Longling County, Xiaoheishan Natural Reserve, Z. Li & L. Wang leg., 17/2/2011; **Paratypes** 1 ♂ (SYNU-654), 1 ♀ (SYNU-655), 2 ♀ (SYNU-656–657), same data as holotype.

Diagnosis. Males of the new species are similar to those of *T. werni* Eichenberger, 2011 in the shape of the male palp, but they can be distinguished by the branch of psembolus with row of combs (Fig. 6D, J) vs a groove with row of lobes (Eichenberger and Kranz-Baltensperger 2011: fig. 12A, B, E, I), and the unfused abdominal dorsal and ventral scuta (Fig. 5C) vs dorsal scutum fused to the epigastric scutum (Eichenberger and Kranz-Baltensperger 2011: fig. 11C). Females can be distinguished from the other *Trilacuna* species by the curved posterior margin of epigastric scutum (Fig. 7F, G) vs roundly bent.

Description. Male (holotype). **Body:** reddish-brown, chelicerae and sternum lighter, legs yellow; habitus as in Fig. 5A–C; body length 2.37. **Carapace:** 1.08 long, 0.89 wide; sides smooth, lateral margin rebordered (Fig. 5D). **Eyes:** ALE largest, PME smallest; ALE separated from edge of carapace by 0.93 diameters (Fig. 5D, F). **Mouthparts:** chelicerae straight, proximal region with one hair with elevated hair base; labium rectangular, anterior margin deeply incised; endites slender, distally not branched (Fig. 5E, G, H). **Sternum:** surface strongly rugose (Fig. 5E). **Abdomen:** 1.36 long, 0.92 wide; booklung covers ovoid, surface

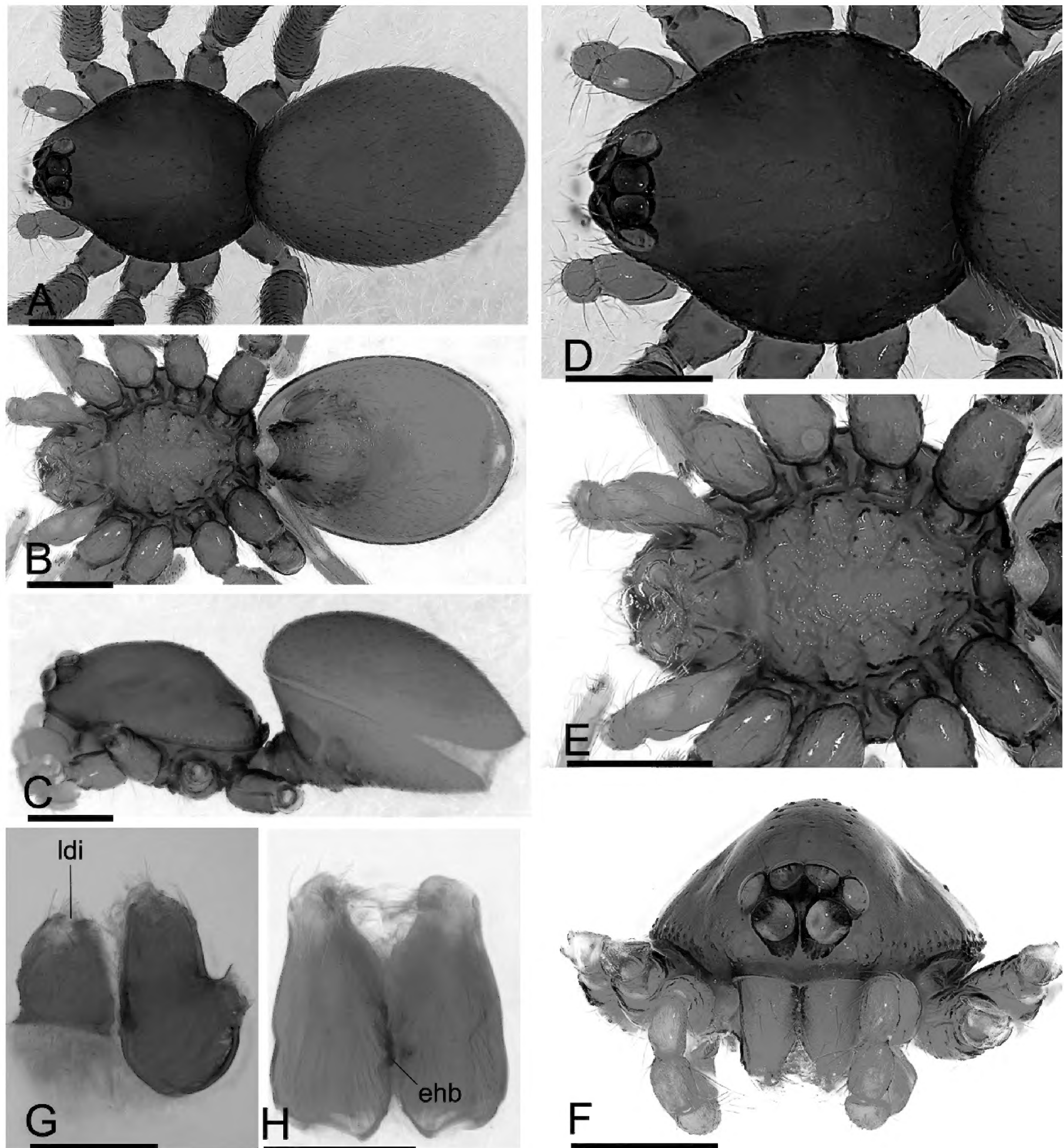


Figure 5. *Trilacuna xiaoheishan* sp. nov., male holotype **A–C** habitus in dorsal, ventral, and lateral views **D–F** prosoma in dorsal, ventral, and anterior views **G** labium and endites in ventral view **H** chelicerae, anterior view. Abbreviations: ehb = elevated hair base; ldi = labium deep incision. Scale bars: 0.4 mm (**A–F**); 0.2 mm (**G, H**).

smooth; apodemes present; sperm pore situated at level of anterior spiracles; posterior spiracles connected by groove (Fig. 5A–C). **Palp:** orange; 0.79 long (0.24, 0.15, 0.17, 0.23); femur greatly elongated (width/length = 0.61); bulb triangle, tapering anteriorly; psembolus with a long distally widened flat branch (wfb), with a row of combs (brc) at basal half of the branch and numerous “hairs” on distal half of the branch; with a retrolaterally long curved branch (lcb), a short dorsal branch (sdb) and a thin median branch (tmb) (Fig. 6).

Female (paratype, SYNU-655). Body: habitus as in Fig. 7A–C; slightly larger than male; body length 2.57. **Carapace:** 1.09 long, 0.91 wide. **Mouthparts:** endites unmodified. **Abdomen:** 1.60 long, 1.13 wide. **Epigastric area:** middle

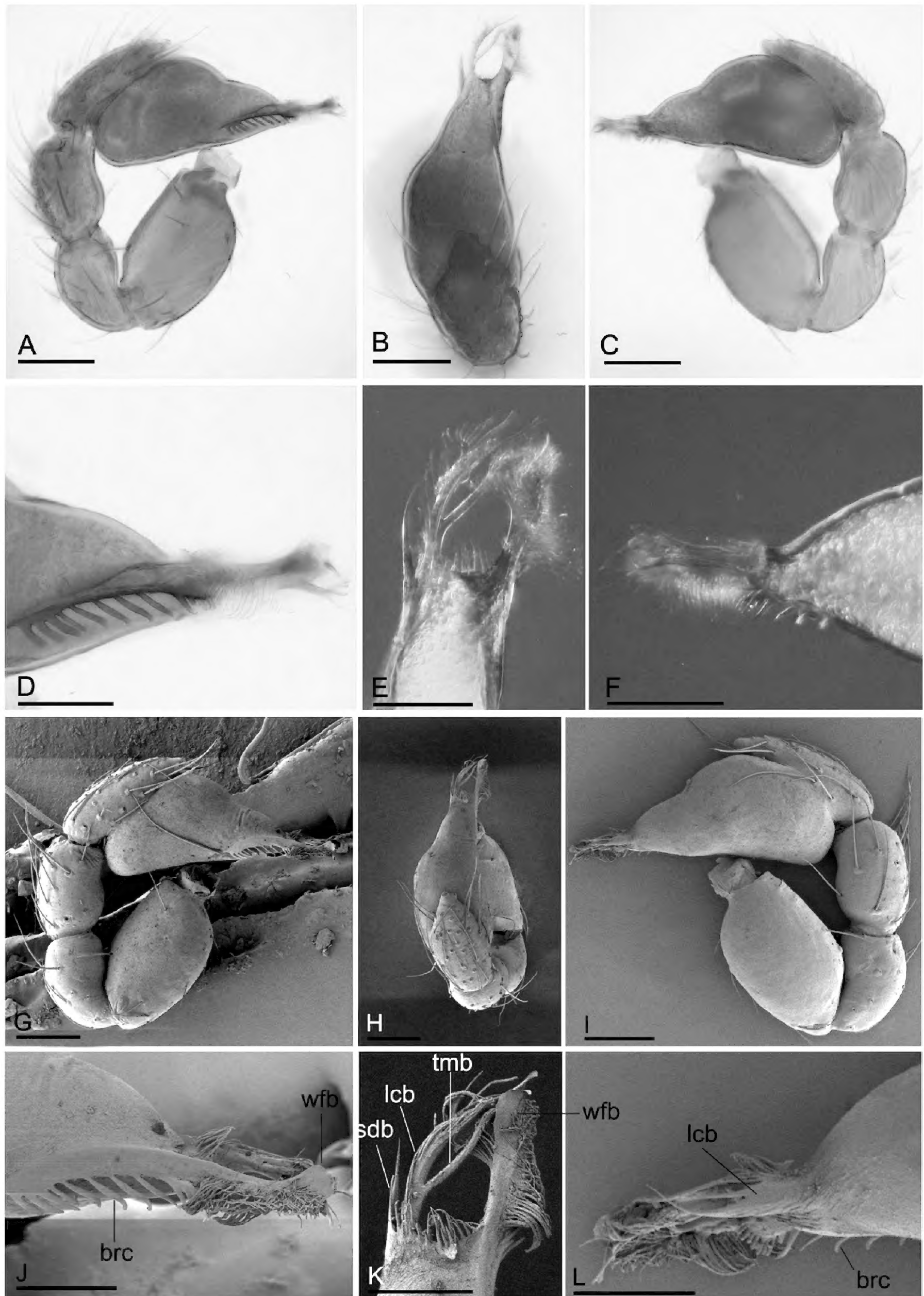


Figure 6. *Trilacuna xiaoheishan* sp. nov., left male palp **A–F** (light) and **G–L** (SEM) **A, G** prolateral view **B, H** dorsal view **C, I** retrolateral view **D, J** distal part of bulb, prolateral view **E, K** distal part of bulb, dorsal view **F, L** distal part of bulb, retrolateral view. Abbreviations: brc = branch with row of combs; sdb = short dorsal branch; lcb = lateral curved branch; tmb = thin median branch; wfb = distally widened flat branch. Scale bars: 0.1 mm (**A–C, G–I**); 0.05 mm (**D–F, J–L**).

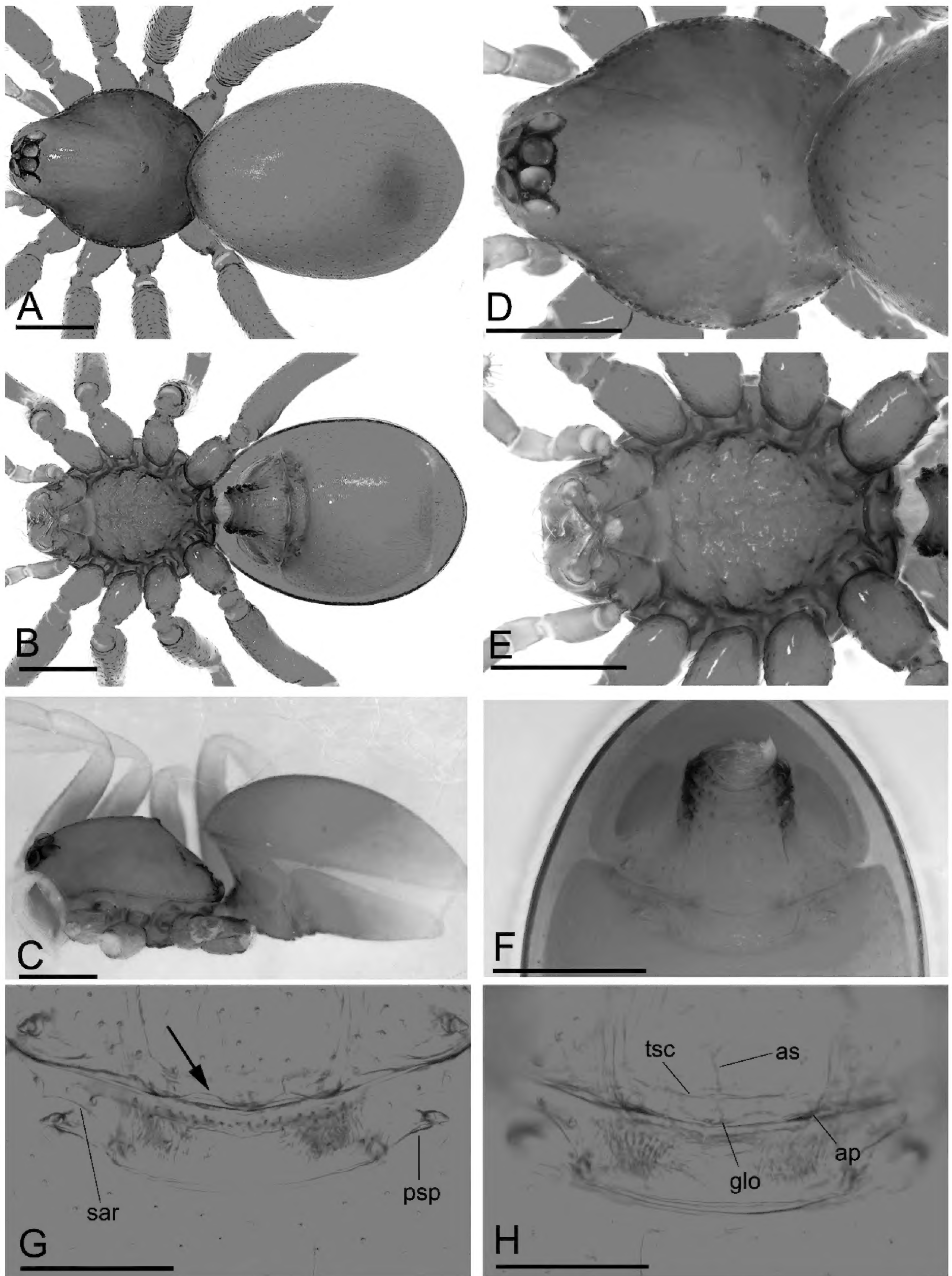


Figure 7. *Trilacuna xiaoheishan* sp. nov., female paratype **A–C** habitus in dorsal, ventral, and lateral views **D, E** prosoma in dorsal and ventral views **F** abdomen in ventral view **G, H** copulatory organ in ventral and dorsal views, arrow shows the curved posterior margin. Abbreviations: ap = apodemes; as = anterior sclerite; glo = globular structure; psp = posterior spiracle; sar = sclerotized, recurved arches; tsc = transverse sclerite. Scale bars: 0.4 mm (**A–F**); 0.2 mm (**G, H**).

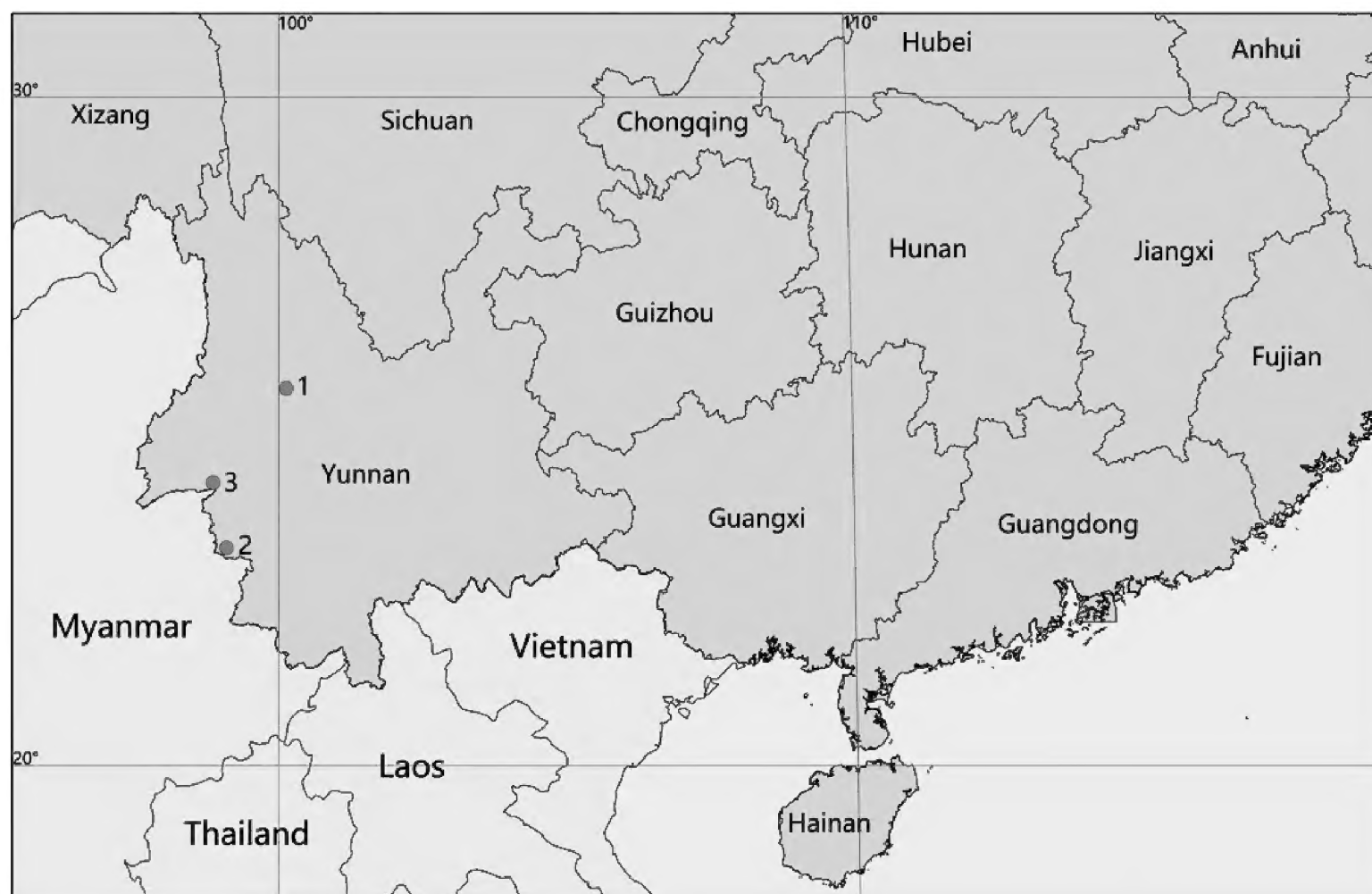


Figure 8. Distribution records of three new species from Yunnan, China. 1. *Trilacuna cangshan* sp. nov.; 2. *Trilacuna wumanshan* sp. nov.; 3. *Trilacuna xiaoheishan* sp. nov.

part of posterior margin of epigastric scutum curved, with sclerotized recurved arches (sar) between posterior spiracles (psp) (Fig. 7F, G). **Endogyne:** with narrow, transversally elongated sclerite (tsc); anterior T-shaped sclerite (as) and posterior small globular structure (glo) (Fig. 7G, H).

Etymology. The specific name is a noun in apposition taken from the type locality.

Distribution. Known only from the type locality, Yunnan Province, China (Fig. 8).

Acknowledgements

The manuscript benefitted greatly from comments by Yuri Marusik (Magadan, Russia), Darrell Ubick (San-Francisco, USA), and Mikhail Omelko (Vladivostok, Russia).

Additional information

Conflict of interest

No conflict of interest was declared.

Ethical statement

No ethical statement was reported.

Funding

This study was supported by the National Natural Science Foundation of China (NSFC-31060070, 31750002, 31972867), and LiaoNing Revitalization Talents Program (XLYC2007044).

Author contributions

Conceptualization: YT. Resources: ZY, ZZ. Software: JM, DB. Writing – original draft: JM, DB. Writing – review and editing: YT, ZY, ZZ.

Author ORCIDs

Jimeng Ma  <https://orcid.org/0009-0008-4579-3506>

Dongju Bian  <https://orcid.org/0000-0002-9324-8026>

Yanfeng Tong  <https://orcid.org/0000-0002-4348-7029>

Zizhong Yang  <https://orcid.org/0000-0002-2143-8226>

Zhisheng Zhang  <https://orcid.org/0000-0002-9304-1789>

Data availability

All of the data that support the findings of this study are available in the main text.

References

- Eichenberger B, Kranz-Baltensperger Y (2011) New *Trilacuna* species from Thailand, Malaysia and Sumatra (Araneae, Oonopidae). *Zootaxa* 2823(1): 1–31. <https://doi.org/10.11646/zootaxa.2823.1.1>
- Grismado CJ, Deeleman-Reinhold CL, Piacentini LN, Izquierdo MA, Ramírez MJ (2014) Taxonomic review of the goblin spiders of the genus *Dysderoides* Fage and their Himalayan relatives of the genera *Trilacuna* Tong and Li and *Himalayana*, new genus (Araneae, Oonopidae). *Bulletin of the American Museum of Natural History* 387: 1–108. <https://doi.org/10.1206/843.1>
- Huang Y, Zhang W, Tong Y, Li S (2020) A new species of the genus *Trilacuna* (Araneae, Oonopidae) from Guizhou Province, China. *Acta Arachnologica Sinica* 29(2): 94–98. <https://doi.org/10.3969/j.issn.1005-9628.2020.02.003>
- Huang Y, Bian D, Tong Y, Zhang Z, Li S (2021) Two new species of the genus *Trilacuna* (Araneae: Oonopidae) from Jinyun Mountain of Chongqing, China. *European Journal of Taxonomy* 748: 1–14. <https://doi.org/10.5852/ejt.2021.748.1337>
- Jocqué R, Dippenaar-Schoeman AS (2006) Spider Families of the World. Musée Royal de l'Afrique Central, Tervuren, 336 pp.
- Malek-Hosseini MJ, Grismado CJ, Sadeghi S, Bakhshi Y (2015) Description of the first cave dwelling species of the spider genus *Trilacuna* Tong & Li from Iran (Araneae: Oonopidae). *Zootaxa* 3972(4): 549–561. <https://doi.org/10.11646/zootaxa.3972.4.6>
- Tong Y, Li S (2007) One new genus and four new species of oonopid spiders from south-west China (Araneae: Oonopidae). *Annales Zoologici, Warszawa* 57: 331–340.
- Tong Y, Chen H, Bai S, Zhang Z, Li S (2019) Seven new species of the genus *Trilacuna* Tong & Li, 2007 from Yunnan, China (Araneae, Oonopidae). *ZooKeys* 821: 11–44. <https://doi.org/10.3897/zookeys.821.29599>
- Tong Y, Li S, Bian D (2020) Taxonomic studies on the genus *Trilacuna* (Araneae, Oonopidae) from Myanmar. *ZooKeys* 960: 39–62. <https://doi.org/10.3897/zookeys.960.54053>
- Ubick D, Dupérré N (2017) Oonopidae. In: Ubick D, Paquin P, Cushing P, Roth V (Eds) *Spiders of North America: an Identification Manual* (2nd edn.). American Arachnological Society, Keene, New Hampshire, 181–182.
- Wang Y, Tong Y, Bian D, Li S (2021) Two new species of the genus *Trilacuna* from Chongqing Municipality, China (Araneae, Oonopidae). *Zootaxa* 4927(3): 431–443. <https://doi.org/10.11646/zootaxa.4927.3.6>
- WSC (2023) World Spider Catalog. Version 24. Natural History Museum Bern. <http://wsc.nmbe.ch> [Accessed on 21 April 2023]